WHAT IS CLAIMED IS:

1. An illumination system for illuminating a surface by use of light from a light source, said illumination system comprising:

an emission angle conserving optical unit effective to emit the light from the light source at a constant divergent angle; and

a diffractive optical element for producing a desired light intensity distribution on a predetermined plane;

wherein said diffractive optical element is disposed at or adjacent a position where light from said emission angle conserving optical unit is collected.

2. An illumination system according to Claim 1, further comprising a multiple-beam producing element, and a light projecting element for superposing light beams from said multiple-beam producing element one upon another on the surface to be illuminated, wherein the predetermined plane corresponds to a light entrance surface of said multiple-beam producing element.

3. An illumination system according to Claim 2, further comprising a zoom optical system for projecting the light intensity distribution, produced

by said diffractive optical element, upon the light entrance surface of said multiple-beam producing element at a predetermined magnification.

4. An illumination system according to Claim 3, wherein there are a plurality of emission angle conserving optical units of different divergent angles, and wherein said emission angle conserving optical units are interchangeably set at a light path in accordance with a change in magnification of said zoom optical system.

5. An illumination system according to Claim 4, wherein an emission angle conserving optical unit placed at the light path is changed by another, whereby a numerical aperture of light incident on the light entrance surface of said multiple-beam producing element is substantially registered with a preset numerical aperture of said multiple-beam producing means.

6. An illumination system according to Claim 1, wherein there are a plurality of diffractive optical elements for producing different light intensity distributions on the predetermined plane, wherein said diffractive optical elements are interchangeably set at a light path to produce a desired light intensity

distribution on the predetermined plane.

7. An illumination system according to Claim 1, wherein said diffractive optical element is a phase type or amplitude type computer hologram.

8. An illumination system according to Claim 1, wherein said emission angle conserving optical unit comprises a fly's eye lens having small lenses arrayed tow-dimensionally.

9. An illumination system according to Claim 1, wherein said emission angle conserving optical unit comprises an aperture and a lens system.

10. An exposure apparatus, comprising:

an illumination optical system for illuminating a mask surface, as a surface to be illuminated, with use of light from a light source, said illumination optical system including (i) an emission angle conserving optical unit effective to emit the light from the light source at a constant divergent angle, and (ii) a diffractive optical element for producing a desired light intensity distribution on a predetermined plane, wherein said diffractive optical element is disposed at or adjacent a position where light from said emission angle

conserving optical unit is collected; and

a projection optical system for projecting a pattern formed on the mask surface, as illuminated with the light from said illumination optical system, onto a wafer.

11. A device manufacturing method, comprising the steps of:

applying a photosensitive material to a wafer;

illuminating a mask surface, as a surface to be illuminated, with use of light from an illumination optical system, wherein the illumination optical system includes (i) an emission angle conserving optical unit effective to emit the light from the light source at a constant divergent angle, and (ii) a diffractive optical element for producing a desired light intensity distribution on a predetermined plane, wherein the diffractive optical element is disposed at or adjacent a position where light from the emission angle conserving optical unit is collected;

projecting, through a projection optical system, a pattern formed on the mask surface onto a wafer; and

developing the transferred pattern.